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MUNICIPAL AFFAIRS

Innovative Housing Grants Program

CARIBBEAN EXPORT HOME

December 1988

Prepared by:

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for
Seven S Structures Inc.

The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of Alberta Municipal Affairs. The Innovative Housing Grants Program is intended to encourage and assist housing research and development which will reduce housing costs, improve the quality and performance of dwelling units and subdivisions, or increase the long term viability and competitiveness of Alberta's housing industry.

The Program offers assistance to builders, developers, consulting firms, professionals, industry groups, building products manufacturers, municipal governments, educational institutions, non-profit groups and individuals. At this time, priority areas for investigation include building design, construction technology, energy conservation, site and subdivision design, site servicing technology, residential building product development or improvement and information technology.

As the type of project and level of resources vary from applicant to applicant, the resulting documents are also varied. Comments and suggestions on this report are welcome. Please send comments or requests for further information to:

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EXECUTIVE SUMMARY

Seven S Structures Inc., an Alberta company, has developed a stressed skin, foam-filled panel system for the factory-manufactured, site-assembled, small structures industry. Through various industry contacts, this system caught the attention of the Amicus Corporation, a company involved in residential land development on the Caribbean island of Antigua. Amicus, in joint venture with the Government of Antigua and Barbuda, retained Seven S to supply in package form and subsequently install in Antigua two demonstration housing units for evaluation and market modelling purposes. The Government/Amicus venture encompassed the provision of up to 2000 single family dwellings, and the sale of package units by Seven S to the joint venture within that scope was dependent on client and public acceptance of the two demonstration units.

Based upon layout designs provided by an architectural consultant to the joint venture, the scope of work by Seven S included manufacture of the stressed skin panels comprising the structures, assembly of all appurtenant materials including fixtures and finishing materials, packaging of the units, shipment of the packaged units from the Grande Prairie manufacturing site to the Antigua job site, preparation of the job site using local labour, and erection of the demonstration units, again using local labour.

The work was originally scheduled for 4 months duration, but actually required 8 months to complete. Contributing to this delay were problems involving production plant efficiencies, time required for appurtenant material package assemblies, shipping times, and adaptation to the customs and practices of local labour forces. Seven S was successful at overcoming the problems that arose, but as a newcomer to the export market, often had to rely on trial and error approaches. Their experience will be of particular interest to similar companies contemplating the sale of their own product in the international marketplace.

The project has been successful. Since the August 1988 completion of the two demonstration units, approximately 25 subsequent orders have been received by Seven S. In addition to single family dwelling designs, Seven S has received orders from various Antigua owners for multiple dwelling unit structures and for commercial low-rise office structures. Due largely to the success of this project, and in response to some of the major problems encountered during it, the company has recently relocated to a larger and more efficient plant facility.

1.0 INTRODUCTION

Seven S Structures is a company that was incorporated to research and subsequently develop a modular, factory-manufactured system of stressed skin panels (7S-3000 System) which incorporates a foamed-in-place insulating core between oriented strand board (O.S.B.) skins.

This type of construction deviates significantly from standard wood frame construction. A stressed skin panel uses less framing material and allows less thermal conductance through the wall and roof. On the basis of the merits of the stressed skin panel, the original shareholders decided to develop the 3000 system. Some in-house panels were constructed and tested. Results suggested that further development of a stressed skin panel building seemed both practical and realistic.

In April 1986, a pilot plant was established in Grande Prairie, Alberta, to produce panels for testing and for construction of prototype projects including residential, commercial and farm buildings. At present, the Company is relocating to a new, larger plant location at Innisfail, Alberta.

Seven S Structures participated in two residential prototype projects, one being in Creston, British Columbia and the other in Grande Prairie, Alberta. In both cases, homes were constructed using the panelized system. The prototype projects proved that the system could be prefabricated, shipped and erected in the time constraints and budgets that had been predicted. Since that time, energy costs, structural integrity of the building and overall performance of conventional finishing materials have been monitored and indicate that construction using the panelized system would be acceptable in today's marketplace.

In Grande Prairie, a commercial project using Seven S panels for the walls proved a great advantage in that the engineering qualities achieved by the wall system were in excess of requirements. Also, using this type of construction over masonry has provided tremendous savings in energy consumption.

Seven S panels were used in the farming community as prototypes for barns housing a swine operation. Once again, speed of erection, ease of erection and energy efficiency achieved have been highlighted by the owner as some of the many benefits. One discovery that stands out is that the animals were not attracted by the urethane foam contained in the wall system and were therefore not inclined to chew at the O.S.B. exterior covering.

1.1 7S-3000 BUILDING SYSTEM

The 7S-3000 Building System provides a fast, precise method of building energy efficient houses, as well as commercial and agricultural buildings. The basic system is a stressed skin load bearing panel having a continuous header, base, and top and bottom plates (Illustrated in Appendix A). The panel is very stiff and can be used vertically, horizontally or on a slope for roofing applications. The panels are filled with polyurethane foam to provide an RSI 4.9 (R-28) insulation value using a 100 mm (4") thick panel. The continuous header permits the future installation of windows and doors in almost any location without installing additional headers.

The 7S-3000 Building System offers the following advantages:

1. ease and speed of installation;
2. precise sizing with no shrinking, warping or twisting;
3. high insulation value per inch of panel thickness with a few easily sealed joints minimizing air infiltration;
4. stronger than conventional framed walls;

5. easily transported and damage resistant during handling and transport;
6. panels can be manufactured up to 7.32 m x 2.44 m (24' x 8') in size; and
7. panels can be assembled by individuals with minimum training.

The 7S-3000 System incorporates common products which have been successfully utilized for many years in similar applications. Presently, oriented strand board (OSB) is used for skins, spacers, reinforcing headers and baseplates. OSB is available locally and is manufactured from Alberta Aspen. OSB is strong and stiff due to the orientation of the fibers during manufacture and can be produced at lower cost than conventional plywood. Polyurethane foam insulation is manufactured from derivatives of natural gas. It has excellent insulating qualities and provides additional strength to the panel when cured inside the panel.

Seven S Structures came upon the opportunity for the Antigua project while doing business in Ottawa with Canada Mortgage and Housing Corporation (C.M.H.C.) regarding the acceptance process for the Seven S stressed skin panel. During discussions with C.M.H.C., it was determined that such a system might be beneficial and of interest to officials responsible for housing in the National Defence Ministry. Seven S, through National Defence, was introduced to a private sector architect/engineer, Mr. Dan Lazoski who was working with a company known as Amicus Corporation Limited to develop designs and specifications for a joint venture agreement with the Government of Antigua and Barbuda. The contract called for the delivery of affordable housing for the residents of these countries.

Mr. Lazoski, upon examining engineering data and physical samples of the Seven S panel, recommended to Amicus Corporation that two demonstration units using the Seven S system be constructed in Antigua complete with all materials and fixtures for a turnkey project.

The client was attracted to the Seven S system by the strength of the stressed skin panel, by the predictability of the product's behaviour in the field, by the significant labour savings that could be realized through the use of components which could be assembled quickly on site by semi-skilled labour and, finally, by the high insulation value.

1.2 THE PROJECT

A joint venture between Amicus and the Antigua Government was struck to create housing stock for the residents of Antigua. It should be realized that in many small countries in this area and in others such as the South Pacific, it is common for Government to entrust projects like this to private corporations where good relationships have been built.

In this case, the Antigua Government had an agreement with Amicus Corporation for the delivery of a minimum of 2000 low cost homes on the islands of Antigua and Barbuda. The role of Seven S Structures was to supply and install two fully finished demonstration homes and, depending upon acceptance by the buying public, to subsequently supply complete home packages to Amicus Corporation as pre-sold by that company.

2.0 CONTRACT NEGOTIATION & FINALIZATION

2.1 TERMS AND CONDITIONS

As required by Amicus Corporation, Seven S Structures worked with Mr. Lazoski in arriving at the designs and specifications for the Antigua project. (See Appendix B.).

In his engineering capacity, Mr. Lazoski reviewed the data on the panels. Once he confirmed this data, he worked with Amicus and Seven S to design units that would be both suitable to the Antiguan marketplace and easily adaptable to the panelization process.

Once the draft design work was completed, Seven S was able to commit to initial pricing on its panels. Seven S was also requested to assemble the entire package including wall and roof panels, interior walls, exterior and interior finishes, plumbing and electrical packages, trim and cabinets. In other words, turnkey units were to be provided. The scope of the project encompassed supply and installation of two demonstration units including site preparation and foundation work.

The all-inclusive materials supply arrangement was necessary since a 27% duty is imposed on materials and fixtures if they arrive separately but not if they arrive as part of a complete package.

Because there was no on-island experience with the system, Seven S was requested to include supervision and responsibility for erection and completion of the two demonstration units in their price. Amicus Corporation was to be entirely responsible for marketing the housing to the Antiguan people once the two demonstration units were in place.

2.2 PRICING

Detailed pricing for production and supply of the panels, purchase and assembly of materials and fixtures necessary for completion, and shipping of the two demonstration units to Antigua is shown in Appendix 'C'.

2.3 SPECIAL CONDITIONS

It should be noted that by agreement between Amicus and Seven S, all payments would be made in U.S. dollars.

The Government of Antigua established conditions to facilitate the sale of houses as its contribution to the joint venture. Amicus was responsible for the presale and delivery of all the housing sold from the two demonstration units.

2.4 TIMING

The time involved from the initial discussions between Mr. Lazoski and the final ordering of the two units was approximately five months.

3.0 PLANNING

3.1 DESIGN FINALIZATION

Design finalization was not a long and difficult task. Mr. Lazoski had, along with Amicus officials, spent time in Antigua and was very familiar with the demands of the marketplace. The key was to tailor these demands into the panelization process for maximum efficiency of production. This was accomplished by familiarizing Mr. Lazoski with the Seven S System which, given his expertise, was a relatively simple task.

It should be noted that if Seven S had little in the way of information on the desires and customs of Antiguans, it would have been necessary for them to do extensive market research to define acceptable and saleable product.

3.2 SCHEDULING

Project scheduling turned out to be too optimistic. In planning a project of this type, contingencies should be built in to allow for the unexpected.

Timing commitments for matters under the absolute control of Seven S were met without much difficulty; however, the project fell behind schedule during transportation of the product and during work involving the people in Antigua. A major on-site theft of fixtures and materials also delayed project completion. All of these factors caused a delay from the April 1988 target to August 1988.

3.3 SUPPLIER CO-ORDINATION

The assembly of materials and fixtures for inclusion in the package was both costly and frustrating. The suppliers of most products were Grande Prairie businesses which were local dealers or distributors for larger dealers, distributors and manufacturers from Edmonton and Calgary. The fact that most materials and fixtures had to be shipped to Grande Prairie and then shipped back as part of the package added more cost. This extra cost, however, was compensated by the elimination of the 27% duty on these items due to their inclusion in the package to Antigua.

3.4 SPECIAL DESIGN CONSIDERATIONS

The only special requirement for the Antigua marketplace was window type. According to Amicus, a jalousie window was absolutely necessary and no substitute could be found that was acceptable. Shortly after installation, it was found that the metal exterior door hardware and light fixtures were already showing signs of corrosion from the salt air and their replacement with plastic will be required.

4.0 FACTORY PRODUCTION

4.1 MAJOR COMPONENT CONSTRUCTION

The production of components was accomplished at the pilot plant in Grande Prairie. The plant, because of winter conditions, was extremely crowded and inefficient. Freshly foamed panels must be stored inside the heated plant for a minimum of twenty-four hours to allow proper curing. This made the physical handling of the product clumsy and labour intensive and restricted the amount of production possible each day.

Termite treatment, originally expected to be applied in Antigua, ended up being part of the production procedure making the process even more costly in both space and labour.

Despite the obstacles, the panels were of high quality and were produced on time and within budget.

4.2 MATERIALS ASSEMBLY

While the panels were being produced, the various materials and fixtures were ordered and received for packaging. Once again, pilot plant restrictions made the storage and handling of these items clumsy and labour intensive. Materials assembly was accomplished in the allotted time frame and within the allowed budget.

4.3 PRICING

Pricing of the panels and materials assembly was very close to the budget allowance. By the time the Antigua project materialized, Seven S had produced enough panels to allow accurate forecasting of pilot plant production costs. With proper manufacturing facilities, increased production efficiencies would have resulted in higher profits. The new plant environment should confirm this and should make loading more efficient.

5.0 TRANSPORTATION

5.1 OPTIMUM ROUTING

When Seven S embarked on this project, they had no experience in shipping their product internationally. The experience gained by shipping the two demonstration units and subsequent loads has been invaluable.

When first confronted with moving product from Edmonton to Antigua, Seven S Structures approached a freight forwarding agent in Edmonton. These agents represented different carriers and were knowledgeable in the methods of moving product to distant destinations. The freight forwarder from Edmonton, in turn, worked with an eastern agent who represented a major transportation company. The agents recommended the use of containers and one was sent to Grande Prairie.

The loaded container was then sent by truck to Montreal where it was loaded onto another trailer and hauled to New Jersey. In New Jersey, the container was loaded onto a barge and shipped to Puerto Rico where it was transferred onto a second barge and sent to Antigua. The final leg from the dock in Antigua to the site was by truck.

Seven S found this routing acceptable at the time; however, the container was difficult to load and unload and the second load, consisting mainly of panels sold by Amicus to a private developer in Antigua, was sent without using a container. The panels were stacked on top of a flat bed trailer and shipped to Edmonton where they were loaded onto rail for shipment to Montreal. In Montreal they were off-loaded from rail to trailer and hauled to New Jersey. In New Jersey, the panels were loaded onto a barge to Puerto Rico where the procedure was repeated to barge them into Antigua. The trip from the barge dock in Antigua to the construction site meant the panels were handled two more times.

This routing proved very costly in labour due to multiple handling of the panels and risky in terms of damage to the panels from being moved too many times.

A third shipment of panels was necessitated by the sale of more product in Antigua and Seven S knew it must find a better method of shipping.

After discussions with the parties involved, it was discovered that the product could be loaded onto the shipping company's trailers right in Grande Prairie. These trailers were hauled to Louisiana in the southern U.S. and were then placed on a barge to Puerto Rico. They were then barged to Antigua and finally trucked to the site. This meant the panels made the trip with no trans-loading, proving this to be the fastest and most inexpensive routing. Appendix 'D' illustrates the various shipping routes.

5.2 PACKAGING

Packaging of product shipped to Antigua also went through an evolving process. The container dropped in the Seven S yard in Grande Prairie was to hold the entire shipment of the two demonstration units. The loading procedure was very difficult as the components had to be loaded one at a time by hand. The packaging procedure was also tedious as the container had be to arranged to minimize movement within. To further frustrate efforts, the material would not all fit into the container. Since the whole packaging procedure was held up awaiting the container, there was no time to send another to Grande Prairie.

The solution was to build two large crates and ship them on the same truck as the container. This was acceptable until the load arrived at New Jersey where the crates were placed in a second container for barging to Antigua.

The second shipment proved to be much easier for packaging as the panels were loaded directly onto a flatbed trailer. Seven S panels are very conducive to stacking and securing onto flatbed trailers; however, there was concern for all the reloading that happened from flatbed to rail then back onto flatbed in Montreal and finally onto the barge in New Jersey.

Certainly, the third shipment brought the best results. In this case, once again, the panels were loaded directly onto a flatbed trailer which was hauled into the southern United States and required no reload at that location as the entire trailer was loaded on a barge and made the trip to the site in Antigua. This will continue to be the system used for further shipments.

5.3 COSTING

Once again, the cost of transportation was a learning experience. The first containerized load resulted in a cost overrun of approximately 30%. Most of the extra cost comprised monies required to off-load and reload the container and crates when changing transportation vehicles, charges for a second crate from New Jersey to Antigua and demurrage charges on the container. Demurrage is a charge for the time a container sits idle awaiting loading onto a transportation vehicle.

The second shipment cost as much or more than the first because of all the handling of the materials in off-loading and reloading from one transport vehicle to the other.

The third attempt was by far the most economical. Once the load was on the flat bed, it was not touched until arrival at the site. Also, the trucking into Louisiana was simpler and more cost efficient.

6.0 SITE WORK

6.1 CO-ORDINATION

During the demonstration unit project, Seven S was delegated the responsibility of co-ordinating site work from stake-out to completion of the units.

In February 1988, Mr. Sid Tissington, President of Seven S Structures, travelled to Antigua to arrange for foundation work and site preparation in order to ensure proper erection of the Seven S package upon its arrival.

The first contractor chosen to complete the footings and foundations for the demonstration houses did not show up and another experienced local contractor was retained for stake-out, excavation, footings and foundations work. The next obstacle was finding a backhoe. The limited planning capabilities of the contractor were questionable and the poor accountability of others such as the backhoe company thwarted efforts to complete the two foundations and concrete floor pads.

On March 5, 1988, David Tissington travelled to Antigua from Grande Prairie to carry out supervision of the two demonstration houses. Upon arrival, Mr. Tissington checked the two house foundations against the blueprints. He discovered that a patio had been missed in the second foundation (completed after Sid Tissington's departure in February). This necessitated arranging for the contractor to complete the work prior to arrival of the material packages. Mr. Tissington noted that the supply of cement can be a problem on the island (which could be overcome by Amicus maintaining an inventory).

At this time it was discovered that the containers carrying the two demonstration houses had been delayed. In fact, the first container did not arrive until March 24. During this time, David Tissington worked on pricing and selling a six-plex to a private developer and assisted in the site preparation of this project.

When the first container arrived, Mr. Tissington spent one entire day processing the paper and customs documents, a procedure which would have taken much longer without his constant pushing. The inspection of the container took place at the site after hours and at an overtime fee of $100 each for the two customs officials. This practice, although questionable, is common and is much simpler as the container does not have to be unloaded and reloaded on its initial arrival.

The unloading procedure proved to be as difficult and time consuming as the loading and was indeed more difficult because there was no fork lift to assist.

With time running short and unloading taking all of Friday, the contractor was requested to work on Saturday and Sunday. Because the unemployment rate on the island is virtually zero and the work force is not motivated by extra money, local labour generally does not work on weekends. It is also contrary to their religious beliefs to work on Sunday. The contractor, however, was persuaded to work and the weekend was spent erecting panels.

Although arrangements had been made to use a power generator supplied by the Government, it was determined that special adaptors were needed to operate the tools. After a half day of futile searching for these adaptors, another generator which did not require adaptors was finally rented from a private company.

A great deal of training of local staff was required for the erection procedures and for the use of tools and equipment; however, they were eager and quickly adapted to the Seven S system as well as to the tools supplied.

Upon erection of the interior walls, it was noted that the prefinished panelling was discoloured and appeared swollen from moisture. Consequently, the interior panelling supplied was discarded completely and the interior walls were resheeted with plywood supplied by a local business. Concern respecting potential moisture damage had been discussed with the supplier of the prefinished panels in Alberta prior to shipment and the supplier guaranteed the product as to its moisture resistance. The supplier, when contacted by Seven S in regard to the moisture problem actually experienced, acknowledged receipt of the information but was not prepared to stand behind the product in the form of reimbursement or adjustment with respect to pricing.

The second container arrived at customs in Antigua on March 28, 1988, four days after the first and was delivered to the site on March 31, 1988. Again, Mr. Tissington stressed that if he had not constantly pushed the broker and the customs people, it would have taken at least four days to clear the containers.

Electrical and plumbing services were roughed in after completion of the wall and roof panels. It should be noted that the electrical supply is of low capacity; therefore, hot water is obtained through solar heaters, and gas is used for cooking.

On April 5, 1988, the containers on site were burglarized and severe losses were incurred including critical tools, basins, toilets, doors, windows and an air compressor. The estimated loss of $12,000 was covered by insurance.

By April 9, 1988, Mr. Tissington had both houses closed in, plumbing and electrical services roughed in, interior walls sheathed and ready for finish treatment, and plasterers trained in applying the finish materials on the interior. The local contractor was briefed on how to complete the project, including installation of windows and doors which would have to be shipped from Canada to replace the stolen product.

As it turned out, David Tissington returned to Antigua in June, 1988, to carry out final completion of the two units. Sales were increasing by this time and Amicus Corporation contracted David Tissington for a period of one year to handle construction. He and his family subsequently moved to Antigua in July, 1988.

6.2 LOCAL LABOUR

Island labour was available to carry out the majority of tasks associated with assembly of the two demonstration units. Installation of concrete footings, concrete block foundations and concrete slab was normal procedure for local trades; however, Seven S personnel had to be the driving force to get things done expediently.

Erection of the panels required direct involvement on the part of the Seven S supervisor as local labour had no perception of how the system went together. However, by the time the two houses were up, the local people were becoming very proficient at assembly. Mr. Tissington noted that a basic assembly manual and/or video would have been very helpful. He also suggested that an initial fact-finding trip would be beneficial in order to gather information on working conditions, local customs and accessibility of tools to better understand the people and their customs.

7.0 CLIENT REACTION/RESULTS

Client reaction to the Seven S product has been swift and specific. Amicus Corp. has sold, and therefore, ordered a duplex, a six-plex, an eight-plex and panels for an office building - all before the demonstration units were even open to the public. Since the opening, twenty-five single family unit orders are being processed. The success of the project is evidenced by the orders that are presently coming forward.

8.0 CONCLUSIONS

Seven S Structures has learned several things from this demonstration project.

As a fledgling corporation, Seven S was reluctant to enter the international marketplace; however, the opportunity existed in Antigua ahead of many that had been identified here at home. The decision to enter Antigua was one of necessity - Seven S needed sales. The demonstration unit project cost Seven S far more than the selling price of the two units; however, the project has resulted is many more orders - so many, in fact, that they along with all other sales, have enabled the Company to move into the larger Innisfail plant. One might say that the demonstration housing project in Antigua was the catalyst needed to move Seven S from pilot plant mentality to production plant stability.

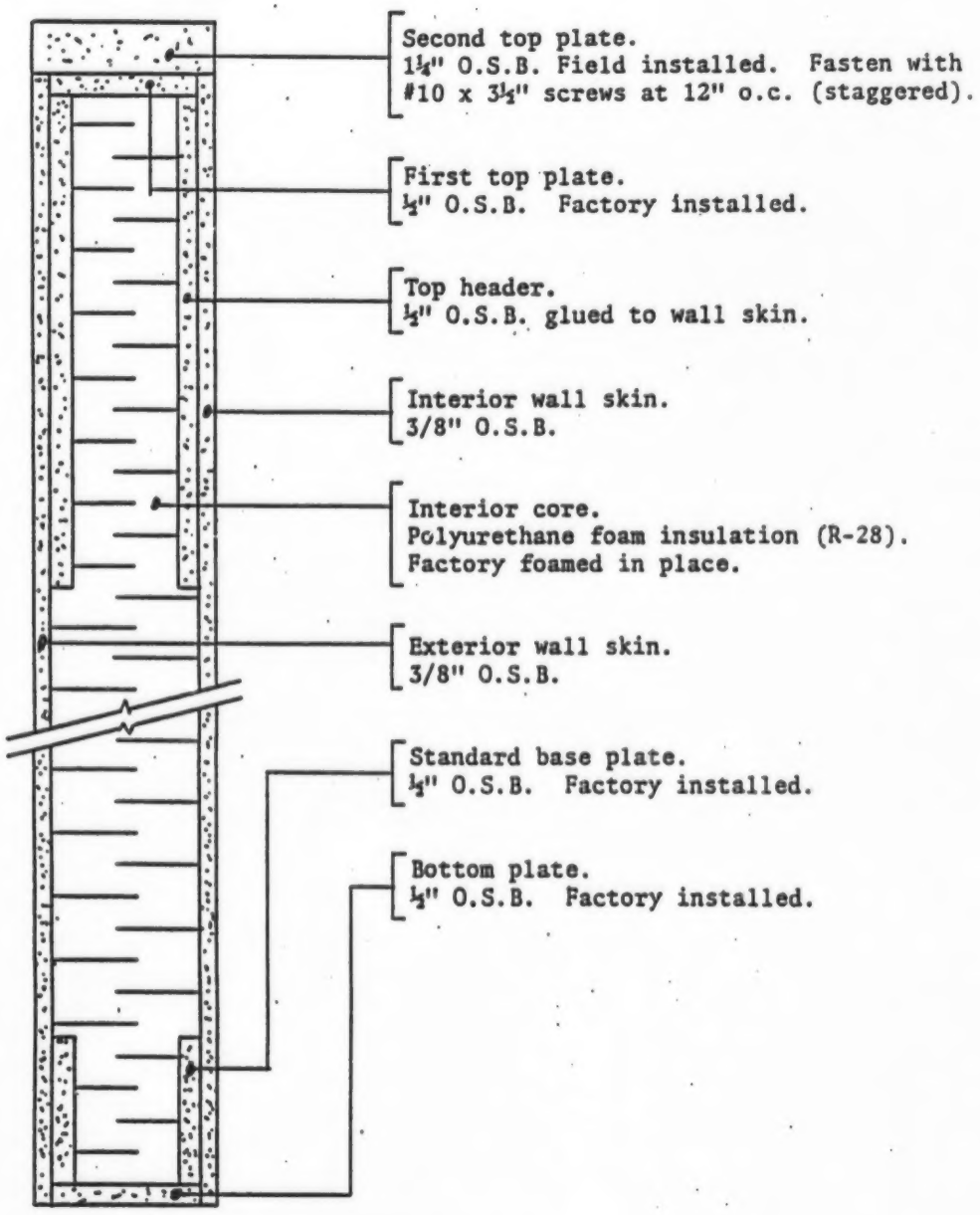
The conclusion can also be drawn that the demonstration unit project aroused Seven S and related personnel to the fact that they have a product which has potential on the international market as well as the national market.

Finally, it can be concluded that this demonstration unit taught Seven S many things about their product, their business, and their capability to produce what might otherwise have required years to learn.

APPENDIX 'A'

THE 7S-3000 SYSTEM

Wall Panel - Vertical Section A1
Wall Panel to Wall Lap Joint Connection A2
Roof Panel to Roof Lap Joint Connection A3
Roof to Wall Connection with Overhang A4
Wall to Roof Connection - no Overhang A5
Roof Connection over Ridge Beam A6
Typical Wall Connection using Wall Expander ... A7
Wall to Floor to Foundation Wall A8
Typical Wall to Floor Connection A9



SEVEN S STRUCTURES INC.

TITLE

7S-3000
WALL PANEL
VERTICAL SECTION

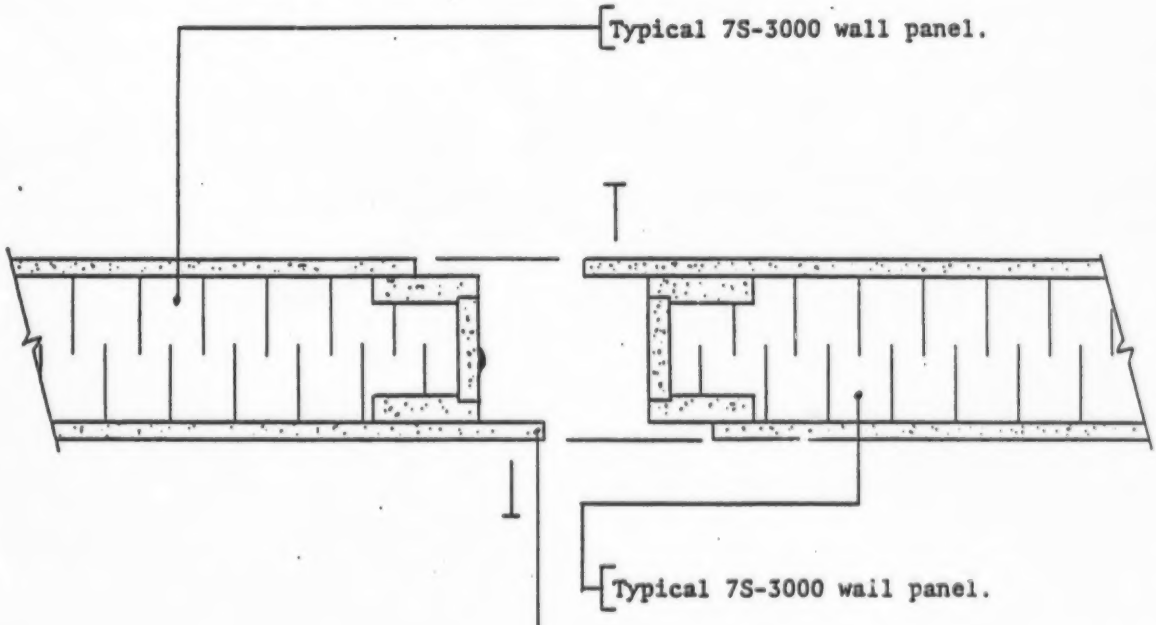
STAMP PROFESSIONAL ENGINEER W. S. KAY ALBERTA

STAMP PERMIT TO PRACTICE
SEVEN S STRUCTURES INC.
Signature
Date June 13, 1988
PERMIT NUMBER: P 4794
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV.

DWG.

A2


Typical 7S-3000 wall panel.
Typical 7S-3000 wall panel.
Typical lap joint.
Secure wall panel to wall panel using
#10 x 1¼" screws at 6" o.c. both sides.
Apply a continuous bead of foam to the
first panel before joining.

SEVEN S STRUCTURES INC.

TITLE

WALL PANEL TO WALL
LAP JOINT CONNECTION

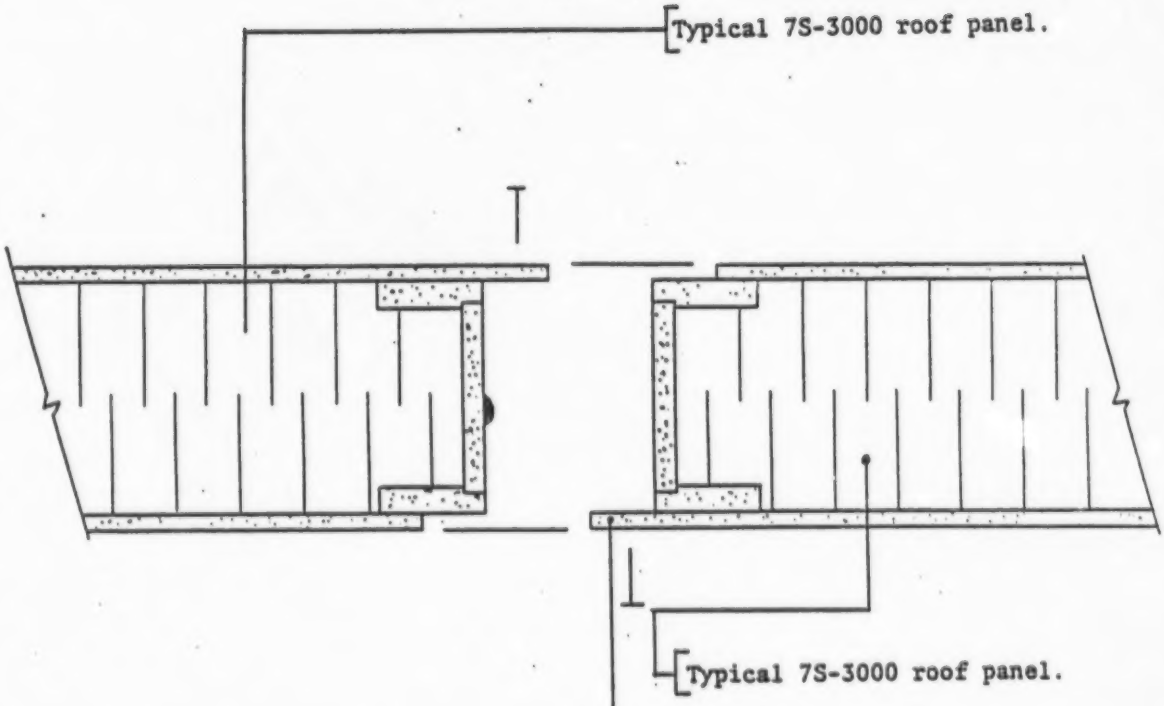
STAMP

PROFESSIONAL ENGINEER ALBERTA
W. S. KAY

STAMP PERMIT TO PRACTICE
SEVEN S STRUCTURES INC.
Signature
Date June 13 1988
PERMIT NUMBER: P 4784
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV.

DWG.


Typical 7S-3000 roof panel.
Typical 7S-3000 roof panel.
Typical lap joint.
Secure roof panel to roof panel using #10 x 1¼" screws at 6" o.c. both sides.
Apply a continuous bead of foam to the first panel before joining.

SEVEN S STRUCTURES INC.

TITLE

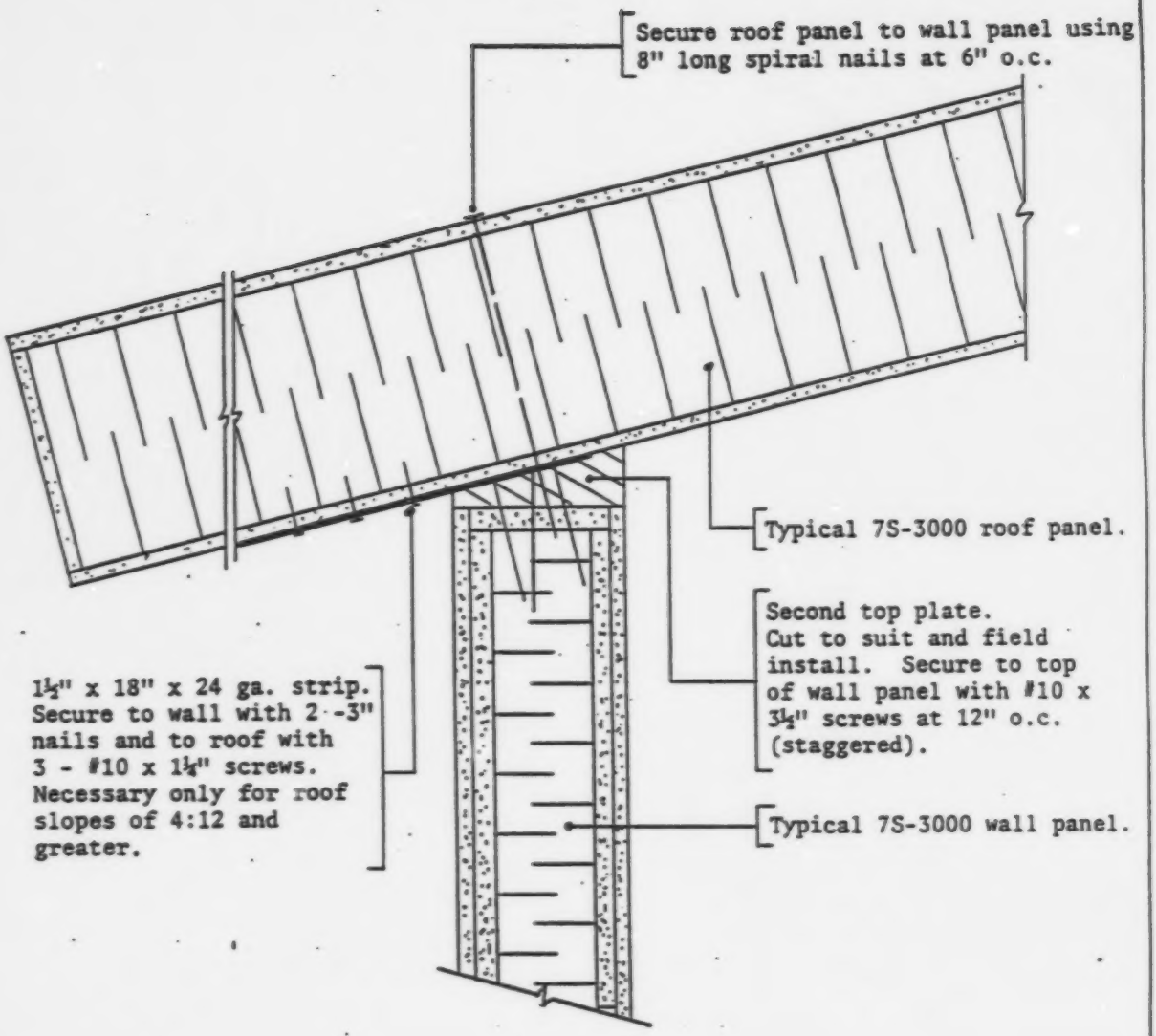
ROOF PANEL TO ROOF
LAP JOINT CONNECTION

STAMP PROFESSIONAL ENGINEER ALBERTA W. S. KAY

STAMP PERMIT TO PRACTICE
SEVEN S STRUCTURES INC.
Signature
Date June 13 1988
PERMIT NUMBER: P 4794
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV.

DWG.


Secure roof panel to wall panel using 8" long spiral nails at 6" o.c.
Typical 7S-3000 roof panel.
Second top plate. Cut to suit and field install. Secure to top of wall panel with #10 x 3½" screws at 12" o.c. (staggered).
1½" x 18" x 24 ga. strip. Secure to wall with 2 -3" nails and to roof with 3 - #10 x 1¼" screws. Necessary only for roof slopes of 4:12 and greater.
Typical 7S-3000 wall panel.

SEVEN S STRUCTURES INC.

TITLE

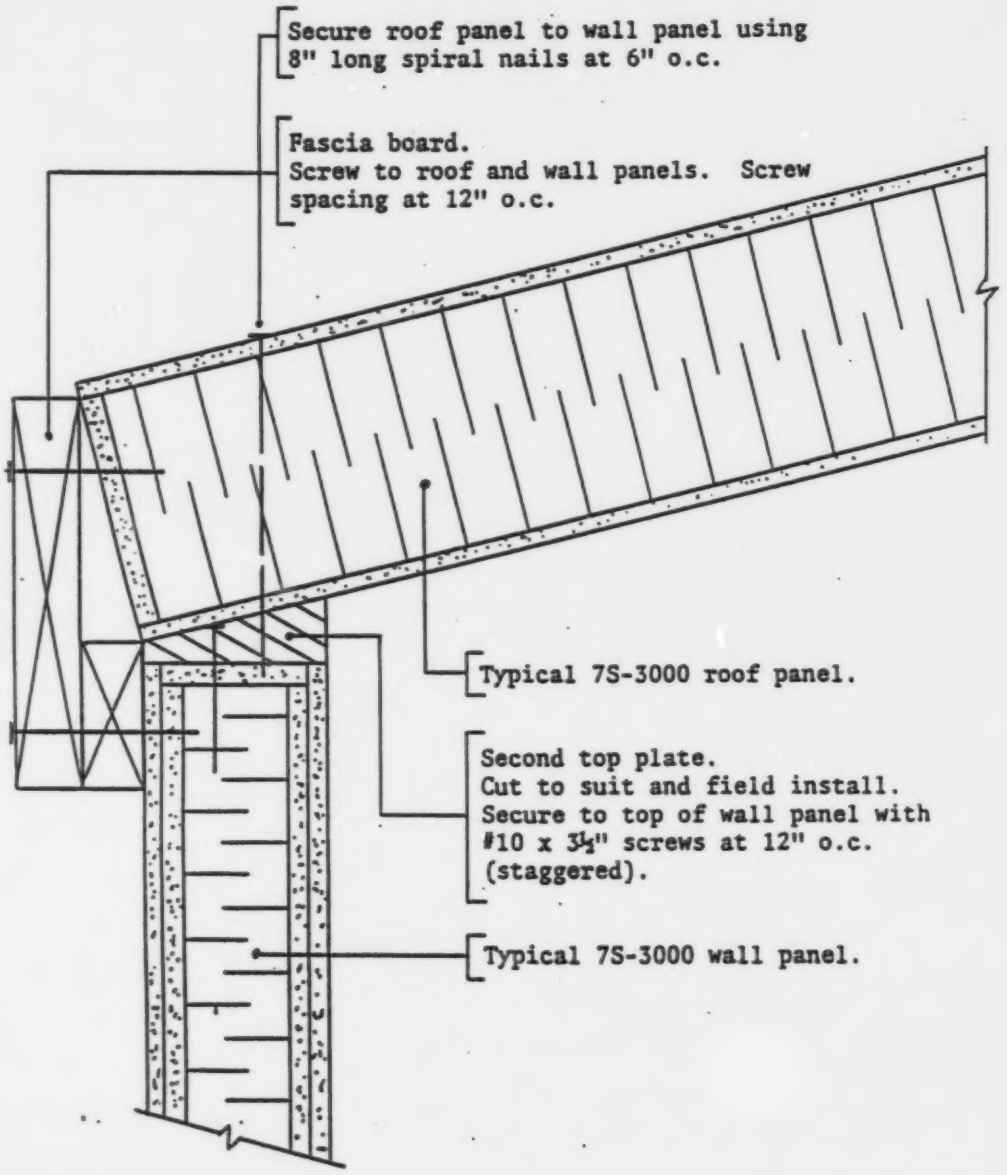
ROOF TO WALL CONNECTION WITH OVERHANG

STAMP: PROFESSIONAL ENGINEER ALBERTA W. S. KAY

STAMP: PERMIT TO PRACTICE SEVEN S STRUCTURES INC.
Signature
Date June 13 1988
PERMIT NUMBER: P 4794
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV.

DWG.


Secure roof panel to wall panel using 8" long spiral nails at 6" o.c.
Fascia board. Screw to roof and wall panels. Screw spacing at 12" o.c.
Typical 7S-3000 roof panel.
Second top plate. Cut to suit and field install. Secure to top of wall panel with #10 x 3½" screws at 12" o.c. (staggered).
Typical 7S-3000 wall panel.

SEVEN S STRUCTURES INC.

TITLE

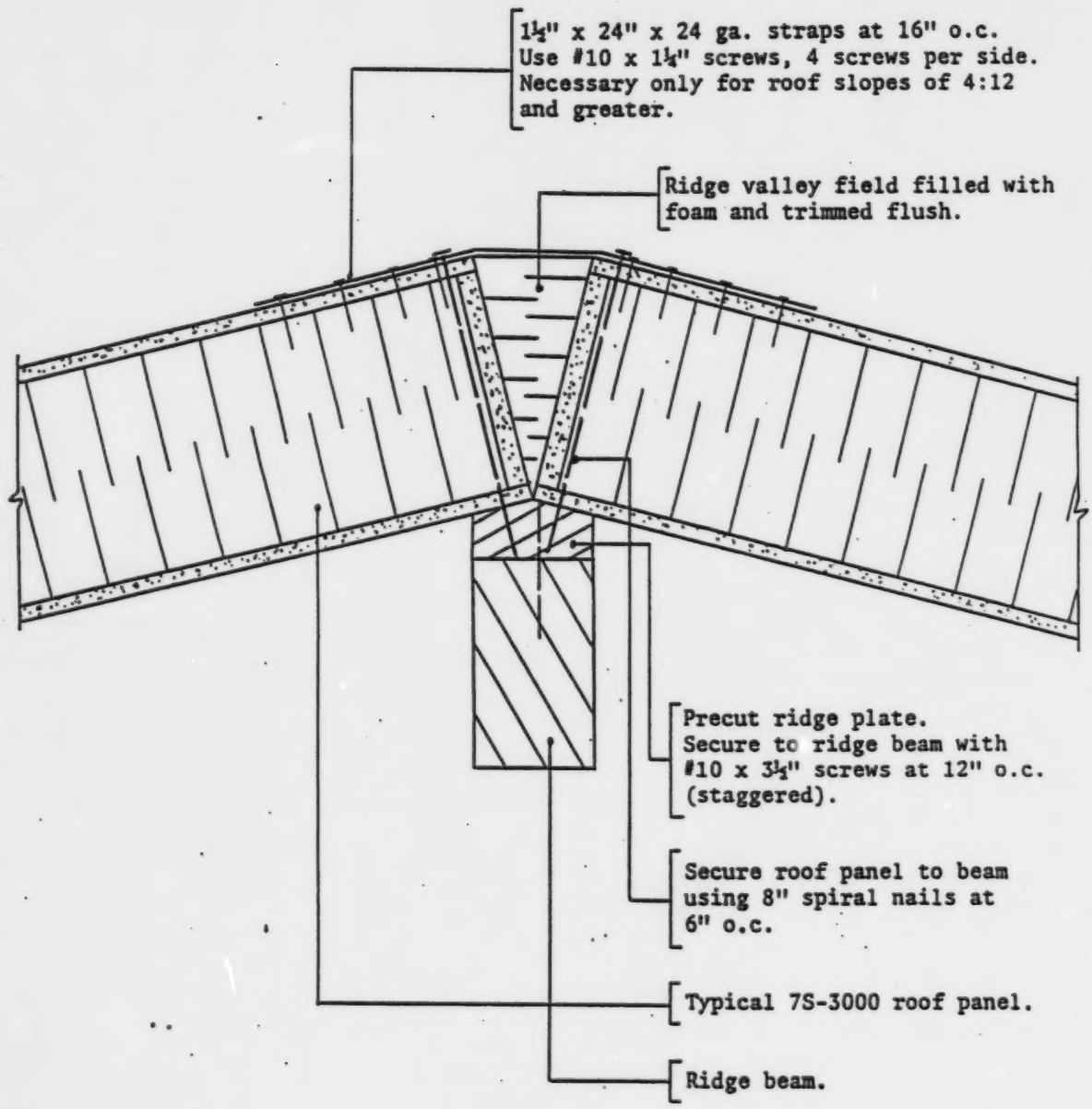
WALL TO ROOF CONNECTION
NO OVERHANG

STAMP PROFESSIONAL ENGINEER ALBERTA J. S. KAY

STAMP PERMIT TO PRACTICE
SEVEN S STRUCTURES INC.
Signature
Date June 13, 1988
PERMIT NUMBER: P 4794
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV.

DWG.


1½" x 24" x 24 ga. straps at 16" o.c.
Use #10 x 1¼" screws, 4 screws per side.
Necessary only for roof slopes of 4:12
and greater.
Ridge valley field filled with
foam and trimmed flush.
Precut ridge plate.
Secure to ridge beam with
#10 x 3½" screws at 12" o.c.
(staggered).
Secure roof panel to beam
using 8" spiral nails at
6" o.c.
Typical 7S-3000 roof panel.
Ridge beam.

SEVEN S STRUCTURES INC.

TITLE

ROOF CONNECTION OVER
RIDGE BEAM

STAMP PROFESSIONAL ENGINEER ALBERTA W. S. KAY

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SEVEN S STRUCTURES INC.
Signature
Date June 13 1988
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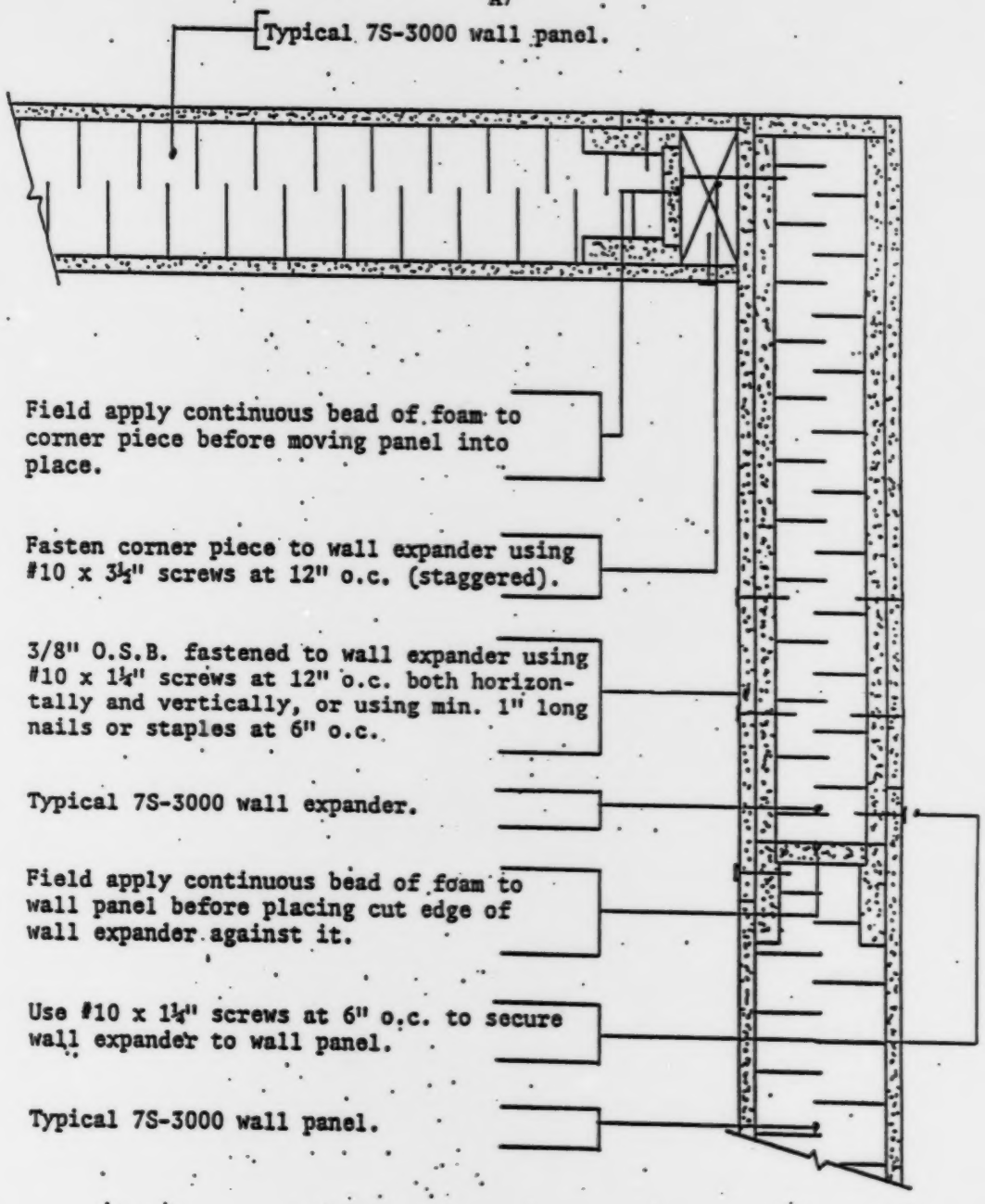
Typical 7S-3000 wall panel.
Field apply continuous bead of foam to corner piece before moving panel into place.
Fasten corner piece to wall expander using #10 x 3½" screws at 12" o.c. (staggered).
3/8" O.S.B. fastened to wall expander using #10 x 1¼" screws at 12" o.c. both horizontally and vertically, or using min. 1" long nails or staples at 6" o.c.
Typical 7S-3000 wall expander.
Field apply continuous bead of foam to wall panel before placing cut edge of wall expander against it.
Use #10 x 1¼" screws at 6" o.c. to secure wall expander to wall panel.
Typical 7S-3000 wall panel.

SEVEN S STRUCTURES INC.

TITLE

TYPICAL WALL CONNECTION USING WALL EXPANDER

STAMP: PROFESSIONAL ENGINEER ALBERTA W.S. KAY

STAMP: PERMIT TO PRACTICE SEVEN S STRUCTURES INC.

Signature

Date June 13 1988

PERMIT NUMBER: P 4794

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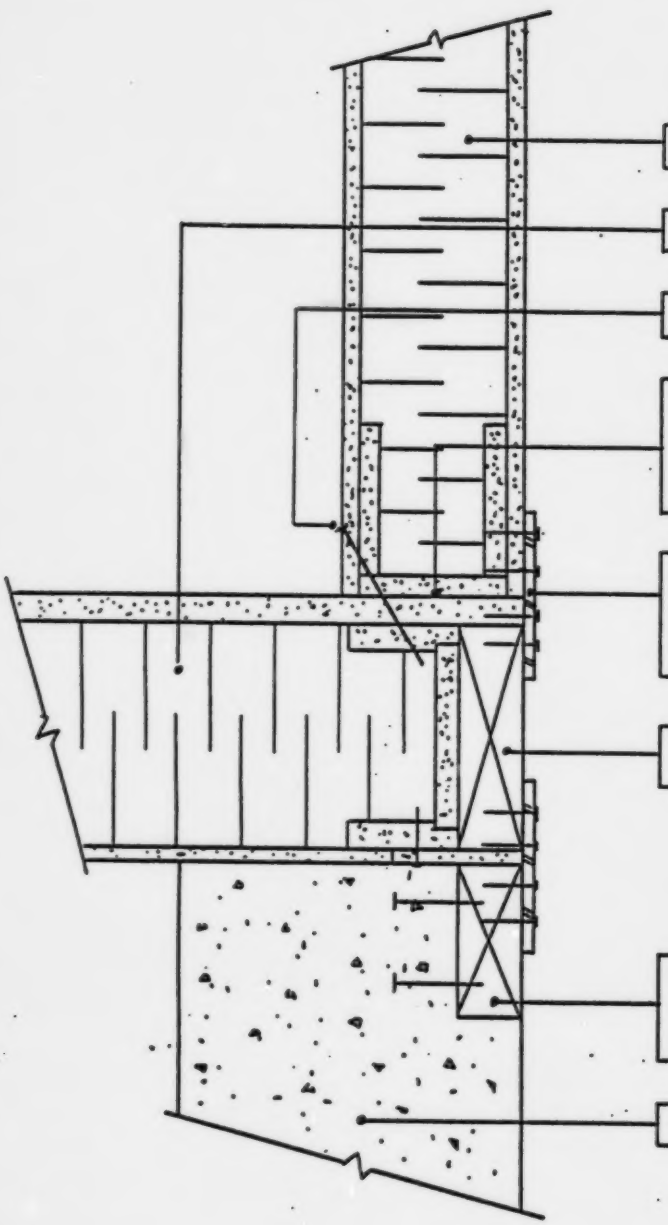
Typical 7S-3000 wall panel.
Typical 7S-3000 floor panel.
#10 x 3½" toe screws at 2'0" o.c.
Field apply a continuous bead of foam to underside of wall panel before positioning and fastening it into place.
4" x 6" x 20 ga. nailer plate at 2'0" o.c. Fasten with 4 - #10 x 1¼" screws top and bottom. (8 screws per plate)
2x6 c/w 3/8" O.S.B. edge piece (5/8" O.S.B. for opposite edge).
Level strip. Pressure treated 2x4 cast into concrete foundation wall.
Concrete wall.

SEVEN S STRUCTURES INC.

TITLE

WALL TO FLOOR TO FOUNDATION WALL

STAMP

PROFESSIONAL ENGINEER ALBERTA W.S. KAY

STAMP

PERMIT TO PRACTICE
SEVEN S STRUCTURES INC.
Signature
Date Jan 13 1988
PERMIT NUMBER: P 4794
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REV.

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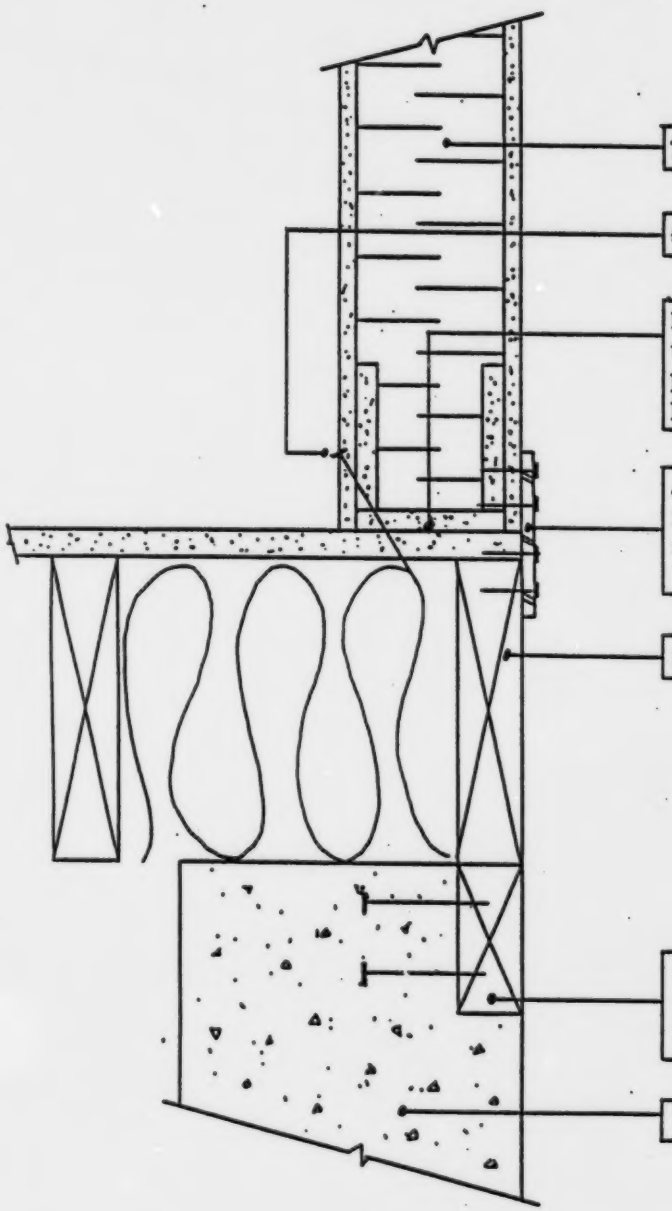

7S-3000 wall panel.
#10 x 3½" toe screws at 2'0" o.c.
Field apply a continuous bead of foam to underside of wall panel before positioning and fastening it into place.
4" x 6" x 20 ga. nailer plate at 2'0" o.c. Fasten with 4 - #10 x 1¼" screws top and bottom. (8 screws per plate)
Standard floor joist assembly.
Level strip. Pressure treated 2x4 cast into concrete foundation wall.
Concrete wall.

SEVEN S STRUCTURES INC.

TITLE

TYPICAL WALL TO FLOOR CONNECTION

STAMP: PROFESSIONAL ENGINEER ALBERTA W.S. KAY

STAMP: PERMIT TO PRACTICE
SEVEN S STRUCTURES INC.
Signature
Date June 13 1988
PERMIT NUMBER: P 4784
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV.

DWG.

APPENDIX 'B'

ANTIGUA HOME DESIGNS

Design Rendering B1

Villa A (2 Bedroom Bungalow)

Floor Plan and Elevations B2

Villa B (3 Bedroom Bungalow)

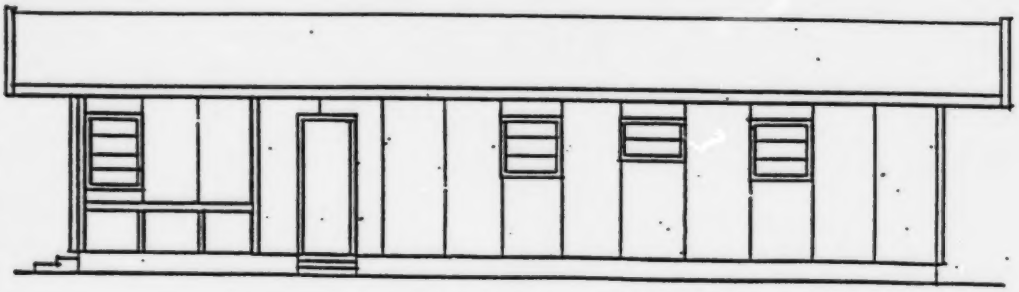
Floor Plan and Elevations B3

ANTIGUA HOUSING PROJECT

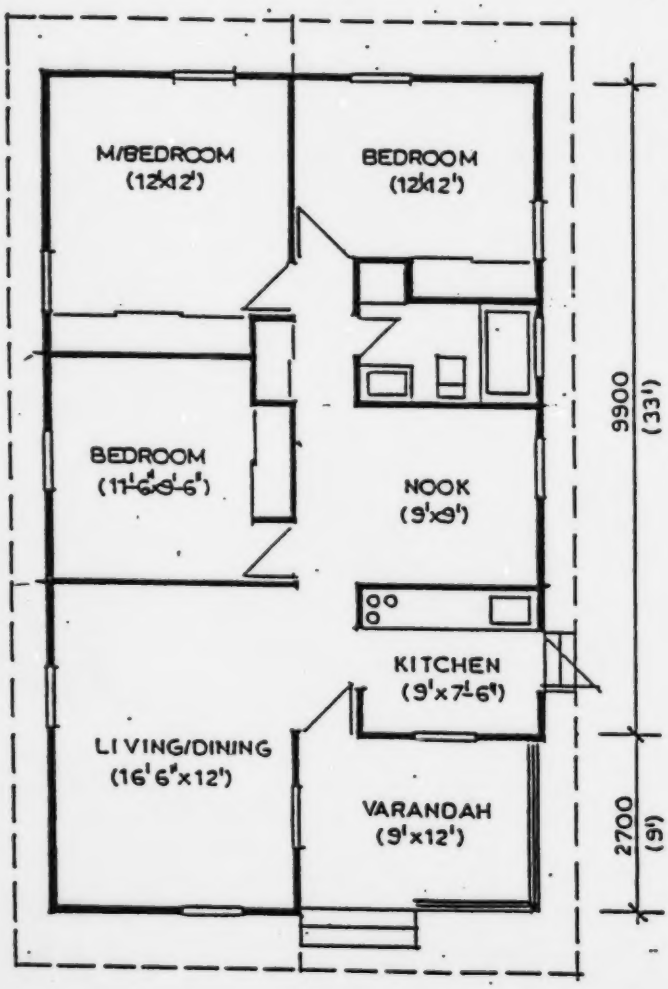
ATJA INC.- CANADA
LAZOSKI ASSOCIES - ARCHITECTES

AMACUS CORPORATION LTD
ANTIGUA W.I.

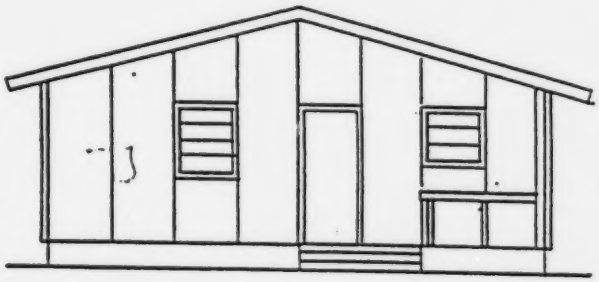
B2



side elevation



floor plan
scale 1:100



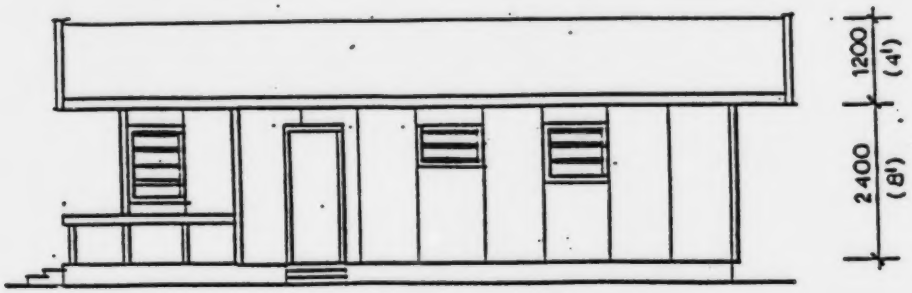
front elevation

VILLA "B"

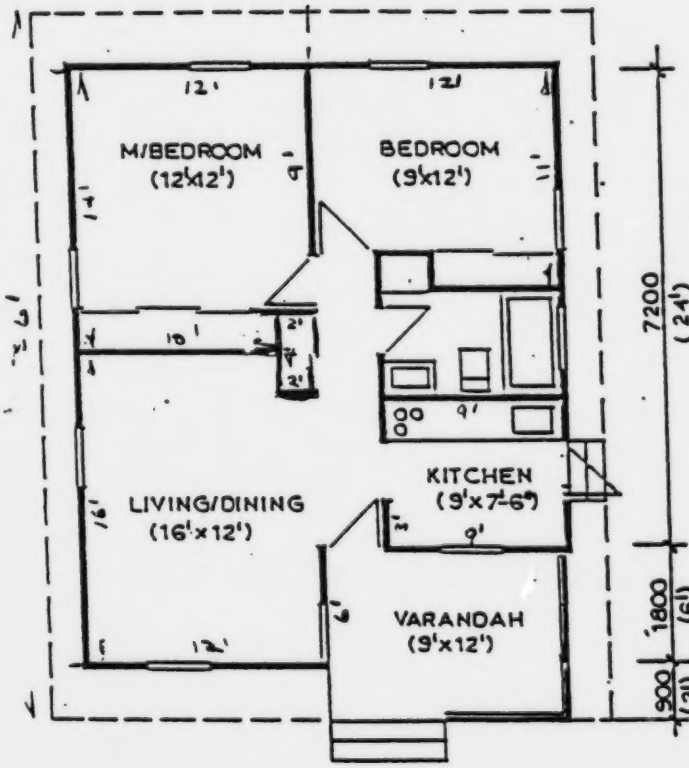
- 3 BEDROOM
- 83 m² (893 sq.ft.)
- VARANDAH 9.7 m² (105 sq.ft.)

ANTIGUA HOUSING PROJECT

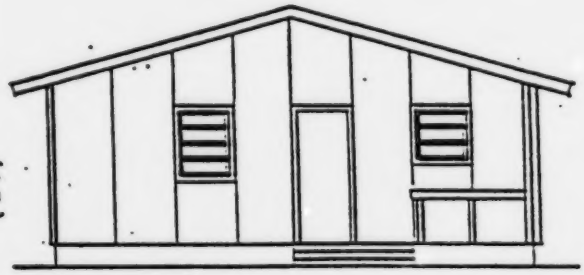
ATSA INC.-CANADA
LAZOSKI ASSOCIES-ARCHITECTES



side elevation



floor plan
scale 1:100



front elevation

VILLA "A"

- 2 BEDROOM
- 60m² (645 sq.ft)
- VARANDAH 9,7m²(105 sq.ft)

ANTIGUA HOUSING PROJECT
ATSA INC.-CANADA
LAZOSKI ASSOCIES-ARCHITECTES

APPENDIX 'C'

PROJECT COSTS

ANTIGUA HOUSING PROJECT COST ACTUAL

	2 Bedroom (A)	3 Bedroom (B)
Shop drawings	100.00	100.00
Exterior walls 3 3/3" R20 panels	1,590.00	1,944.00
Interior walls (no insulation c/w sheeting)	440.00	591.00
Wall to ceiling fillers NOTE: eaves & patio panels unfoamed	244.00	264.00
Roof panels 4 1/4" R30 panels	1,640.00	2,073.00
Gable ends 3 1/4" R20 panels	113.00	170.00
Eave extensions	95.00	120.00
Fascia 1/2" OSB	22.50	28.50
Top plates	12.80	17.60
Peak foam	16.30	20.00
Tie down plates	21.00	24.50
Foam peaks	24.00	24.00
Caulking	44.34	51.73
Corner connector pieces	49.56	49.56
Screws	67.94	78.93
Nails	101.00	101.00
Windows - Louvered style	2,183.00	2,653.00
Exterior doors	300.00	300.00
Plumbing package	887.00	887.00
Electrical package	757.00	787.00
Roofing	830.50	1,068.56
Soffit and fascia	340.00	356.00
Stucco	618.00	745.00
Deck railing	72.00	87.00
Batt insulation	15.00	15.00
Texture for ceiling & walls	376.00	514.00
Wall paper	689.00	891.00
Cabinets	975.00	975.00
Millwork	1,325.00	1,528.00
Bathroom accessories	48.00	48.00
Painting	356.00	464.00
VA tile	334.00	456.00
Crates & loading	1,600.00	1,600.00
Termite Treatment	900.00	900.00
Misc. and contingency	150.00	150.00
Shop overhead	174.00	174.00
Insurance	65.06	66.12
	17,576.00	20,322.50
Plus 20%	3,456.00	4,004.50
Amount Quoted	21,032.00	24,327.00
Amount billed	21,032.00	24,327.00
Shipping (Actual)	6,648.00	6,648.00
Sub-Total	27,680.00	30,975.00

ANTIGUA HOUSING PROJECT COST ACTUAL - continued

	2 Bedroom (A)	3 Bedroom (B)
Costs incurred by Seven S for Site Preparation and Erection		
Tools & Equipment	328.75	328.75
Foundation Labour	12,036.23	12,036.23
Erection (D. Tissington)	1,362.67	1,362.67
Sub-Total	41,407.65	44,702.65
Travel & Living Expenses/Equipment and Truck Rental		
Sid Tissington (February trip)	2,737.04	2,737.04
David Tissington (March trip)	6,439.34	6,439.34
David Tissington (June trip)	2,222.03	2,222.03
TOTAL	52,806.06	56,101.06

APPENDIX 'D'

SHIPPING ROUTES

ROUTE 1 (COSTLY)
1-3-4 - TRUCK
4-6-7 - BARGE

ROUTE 2 (COSTLY)
1-2 - TRUCK
2-3 - RAIL
3-4 - TRUCK
4-6-7 - BARGE

ROUTE 3 (COST EFFECTIVE)
1-5 - TRUCK
5-6-7 - BARGE

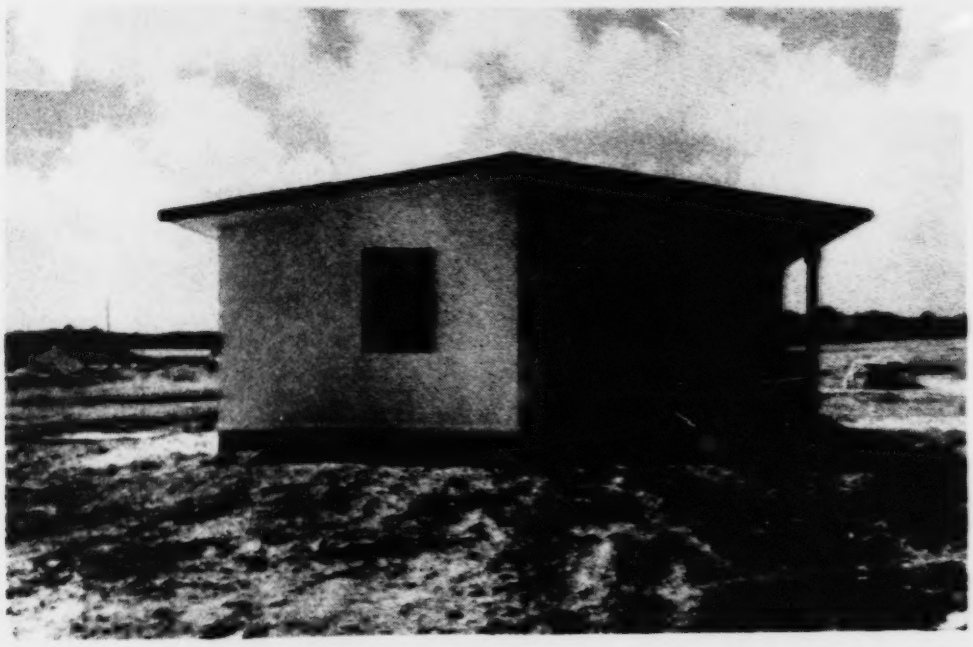
APPENDIX 'E'

PHOTOGRAPHS

Two bedroom demonstration unit

Three bedroom demonstration unit

Three bedroom demonstration unit

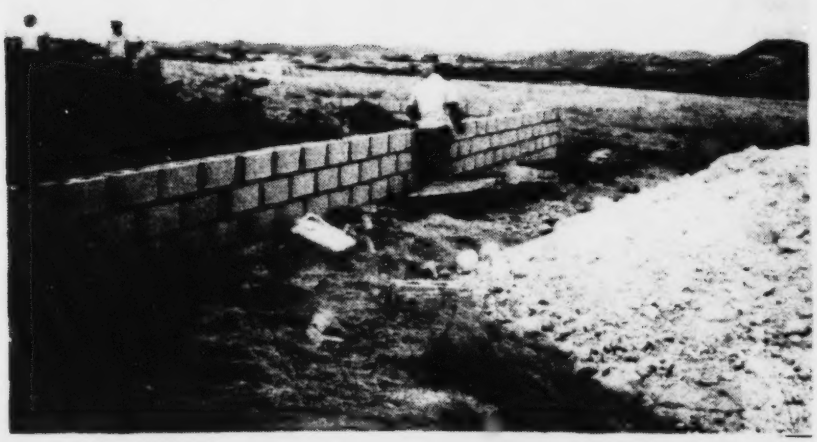


Two bedroom demonstration unit

Trenching for footings on demonstration unit

Self-contained concrete mixer pouring footings

Backfill ready for levelling on demonstration unit



Foundation complete on demonstration unit

Foundation work on demonstration units

Foundation work on demonstration units